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CHAPTER 8

Methods of Ingenuity: The Renaissance Tradition behind Descartes's *Regulae*

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In the middle of Rule IV of the *Regulae ad directionem ingenii*, the rule where he famously invokes a *mathesis universalis*, Descartes says:

> I persuade myself that certain first seeds of truths, sown in human *ingenia* by nature, which we extinguish in ourselves by daily reading and hearing various errors—that such powers existed in that primitive and pure antiquity. Thus by the same light of the mind that let them see, without knowing why, that virtue should be preferred over pleasure and the noble over utility; by this light they also knew the true ideas of Philosophy and Mathematics, even though they could not yet pursue those sciences completely.[1]

Descartes is a wiley interpreter of the textual tradition. Like any good humanist, he signals his knowledge of antiquity, praising the ancients as 'great *ingenia*' whose mental power was primal and vigorous. Yet as a talented emulator—not imitator—of those ancients, he also demonstrates that he has not learned too much from these models. He accepts no content from them, but only takes up the order of their inquiry as he begins his mental exercises with mathematics. A few lines later Descartes observes that the ancients were committed to mathematics because it offered a powerful method, while he criticizes them for having cunningly hidden the details.

1 AT X, p. 376: 'Sed mihi persuadeo, prima quaedam veritatum semina humanis ingeniis a natura insita, quae nos quotidie tot errores diversos legendo et audiendo, in nobis extinguimus, tantas vires in rudi ista et pura antiquitate habuisse, ut eodem mentis lumine, quo virtutem voluptati, honestumque utili praeferendum esse videbant, etsi quare hoc ita esset, ignorarent, Philosophiae etiam et Matheseos veras ideas agnoverint, quamvis ipsas scientias perfecte consequi nondum possent.' In the next line Descartes finds these 'true traces' in Pappus and Diophantus. All translations my own unless otherwise stated.

In Rule IV Descartes alludes to many characteristics of a good method. First, he focuses on the inborn powers of the mind that the term *ingenium* denotes.[2] Second is immediate intuition: he finds his way to the ancients, not through their doctrines, but through their *experience* of the light of the mind. In fact, the rule itself is a performance of Descartes's own method: analysis into simple intuitions, then ordering and enumerating them to make chains of inference—a procedure which texts and talk simply corrupt.

Yet Descartes is just as coy about his recent sources as he is with the ancients. One would never guess that in the *Regulae* Descartes takes on a pedagogical genre that was reasonably well established by the late sixteenth century. Moreover, in this Renaissance genre of textbook methods many of Descartes's moves are commonplaces. I argue that the same Cartesian method which promises a *mathesis universalis* also taps into humanist pedagogical practices, where 'method' is a tool of invention that straddled the line between bodily technique and mental procedure: *exercitationes ingenii*. My argument parallels the now-orthodox view that Renaissance natural history—whether Aldrovandi's collecting of observations or Jean Bodin's *Theatrum* or Francis Bacon's histories—grew out of humanist practices of commonplacing learned in school.[3] Cartesian conceptual method, like the new natural history, depended on Renaissance school practices. Some studies have made steps in this direction, setting Descartes's *Regulae* in the context of Renaissance encyclopaedic aims, but they have tended to

2 On the semantic field of *ingenium*, see the chapter in this volume by Igor Agostini, as well as the monograph by Alexander Marr, Raphaële Garrod, José Ramon Marcaida, and Richard Oosterhoff, *Logodaedalus: Word Histories of Ingenuity in Early Modern Europe* (Pittsburgh: Pittsburgh University Press, 2018).

3 See especially the classic studies of Ann Blair, "Humanist Methods in Natural Philosophy: The Commonplace Book," *Journal for the History of Ideas*, 53.4 (1992), pp. 541–51; Ann Blair, *The Theater of Nature: Jean Bodin and Renaissance Science* (Princeton: Princeton University Press, 1997). For natural history, this has become a dominant paradigm: e.g. Fabian Krämer, *Ein Zentaur in London: Lektüre und Beobachtung in der frühneuzeitlichen Naturforschung* (Affalterbach: Didymos-Verlag, 2014); Richard Yeo, *Notebooks, English Virtuosi, and Early Modern Science* (Chicago: University of Chicago Press, 2014). Bacon's dependence on the tradition was already signalled by the pioneering study of Lisa Jardine, *Francis Bacon: Discovery and the Art of Discourse* (Cambridge: Cambridge University Press, 1974).

compare the *Regulae* with particular projects.[4] My point is not that Descartes deliberately took a position within an established, highly theoretical debate—though that may be true. Rather, I wish to suggest that we take account of a much broader range of texts and practices. In the *Regulae* Descartes assembles parts of a simple pedagogical genre that by the early seventeenth century was omnipresent, even taken for granted, as the basis for learning.

Ingenium is the lens that should draw our eye to the space Descartes shared with this pedagogical tradition. My account of it will be in two parts: first I survey the genre in necessarily stark outline, and then I briefly consider the question of mathematics and method.

1 The Manuals of Method

Ingenium featured as a crucial, if imprecisely used, term in the countless Renaissance handbooks on educational method. Humanist pedagogues were acutely sensitive to their *ingenium* or innate powers and how these might be moulded. They were thus preoccupied with the same conundrum that runs through Descartes's *Regulae*: how much of learning depends on the student's own ingenuity, and how much relies on an art one can learn? No one knew better than teachers of the new style of humanism such as Pier Paolo Vergerio how much depended on a student's raw material. His own *De ingenuis moribus et liberalibus adolescentie studiis* (ca. 1400–1402) began with a guide for determining 'the signs of a liberal *ingenium*' (*signa liberalis ingenii*), such as curiosity, keenness for praise, and love

4 Paolo Rossi, *Logic and the Art of Memory: The Quest for a Universal Language*, trans. Stephen Clucas (1983; London: Continuum, 2000), pp. 123–28, on enumeration in the *Regulae*; Wilhelm Schmidt-Biggemann, *Topica universalis: eine Modellgeschichte humanistischer und barocker Wissenschaft* (Hamburg: Meiner, 1983), pp. 293–97; Nelly Bruyère, *Méthode et dialectique dans l'œuvre de La Ramée: Renaissance et âge classique* (Paris: J. Vrin, 1984), pp. 385–94; André Robinet, *Aux sources de l'esprit cartésien: l'axe La Ramée-Descartes—de la "Dialectique" des 1555 aux "Regulae"* (Geneva: Vrin, 1996); Édouard Mehl, *Descartes en Allemagne: 1619–1620* (Strasbourg: Presses Univ. de Strasbourg, 2001). And see now the exemplary study of Claus Zittel, *Theatrum philosophicum: Descartes und die Rolle ästhetischer Formen in der Wissenschaft* (Berlin: Walter de Gruyter, 2009).

of glory.[5] As Battista Guarino put it in his widely read account of his father's teaching methods (1459), the desire to learn arises spontaneously as 'something a teacher cannot give them from the outside'.[6]

Such handbooks therefore balanced what nature bestowed with techniques for channelling and developing those natural gifts. To consider nature, some turned to natural philosophy and nature's maker for help in characterising *ingenia*. A popular version was Maffeo Vegio's *De educatione* (1445–1448), which centred on the example of Augustine's mother Monica, since the mother influences a child's nature in the most profound ways:

> for physicians say that the force is so impressed that the seed has the causes and conditions when it establishes generative roots; what the seed pours into human bodies and *ingenia* will never be washed away.[7]

Vegio drew on common medical wisdom, sharing territory with books of women's secrets on how to make strong babies, framing education in naturalistic terms, and including advice on medicines for the body.

As manuals of technique, such books supplied arts to sharpen, augment, restrain, and prompt one's *ingenium*. Of course, the best way to deal with a given *ingenium* was to buy the book and hire its author to teach your children; writers like Erasmus typically addressed their wise words to youths, but dedicated them to parents and other prospective patrons who could pay.[8]

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5 Pier Paolo Vergerio, *De ingenuis moribus ac liberalibus studiis*, in *Humanist Educational Treatises*, ed. by Craig W. Kallendorf (Cambridge, MA: Harvard University Press, 2002), pp. 9–15. More generally, see David Robey, "Humanism and Education in the Early Quattrocento: The *De ingenuis moribus* of P. P. Vergerio," *Bibliothèque d'Humanisme et Renaissance*, 42.1 (1980), pp. 27–58.

6 Battista Guarino, *De ordine docendi et studendi*, in Kallendorf, *Humanist Education Treatises*, p. 262: 'Ut quam eis praeceptor extrinsecus tradere non potest discendi cupiditatem.'

7 Maffeo Vegio, *De educatione liberorum* (Paris, 1511), cap. 1.3 (fol. 7r): 'quam certe ita tenacem imprimi medici tradunt, ut quas rationes conditionesque semen habuerit dum generationis radices iacit, easdem infundat nunquam abluendas in humana corpora atque ingenia.'

8 Anthony Grafton and Lisa Jardine, "Humanism and the School of Guarino: A Problem of Evaluation," *Past & Present*, 96 (1982), pp. 51–80; Anthony Grafton and Lisa Jardine, *From Humanism to the Humanities: Education and the Liberal Arts in Fifteenth- and Sixteenth-Century Europe* (Cambridge, MA:

Since the goal of education was to make skilled bookmen, Erasmus and his colleagues offered bookish techniques: they offered lists of books, handbooks of proverbs and quotations, and rules for spelling and developing an abundant Latin style—such books of advice were widely printed and imitated. But such bookish advice often turned out, especially in the fifteenth and early sixteenth century, to be about bodies. While offering schemes for managing information, such handbooks also offered stock medical advice for managing one's body and mind. In a genre of handbooks known as 'arts of memory', authors captured rules for ameliorating forgetfulness, for making the most of your *ingenium*. The stock examples are found in Giovanni Michele Alberto da Carrara's recipe for 'oil of philosophers' and his diet of ginger, anacardina, and rhubarb, all intended to help the memory. Such remedies for the beleaguered scholar also fill Marsilio Ficino's bestselling *De vita triplici* (1489), an elaborated compendium of techniques for manipulating one's *ingenium*.[9]

Central to these how-to books for would-be scholars is the notion of *exercitationes ingenii*, practices that join bodily care to mental procedures. As Descartes said in the *Regulae*, the challenge was not merely understanding, but *remembering*. Carrara's version began with the importance of memory, which suggested he thought of all his rules for developing the *ingenium* as a matter of such exercise:

> For the studious, it is easy to read many things, it is good to understand many things, and this is not difficult to a well-trained *ingenium*. However, to gather these things and keep them in the box of one's memory so that they do not ebb away, is a necessary and preeminent good of human life.[10]

Harvard University Press, 1986). The fine words about the ennobling potential of education to elevate souls were certainly an exercise in self-promotion—but that fact does not preclude serious intellectual intent.

9 On the editions of the book see Marsilio Ficino, *Three Books on Life*, ed. and trans. Carol V. Kaske and John R. Clark (Tempe, Arizona: Medieval & Renaissance Texts & Studies, 1989), pp. 8–9.

10 Michele Alberto da Carrara, *De omnibus ingeniis augendae memoriae* (Bologna, 1491), sig. a1r: 'Nam multa legere studiosis facile, multa quoque intelligere bono, atque exercitato ingenio non difficile est. Verum ea congerere, et in scrinio memorie conservare ita, ut non effluant, necessarium ac precipuum est humane vite bonum.' Cf. Pliny, *Historia naturalis*, 24.

A little further down the page, Carrara adapted the usual source for thinking about *exercitationes ingenii*, namely Cicero's instructions on memory in the *Rhetorica ad Herennium*. Cicero had taught how to construct vivid images according to a natural order, 'in which the *ingenium* cannot be confused in enumerating' the series of things to be remembered.[11] Guarino's *De ordine docendi et studendi* linked Cicero's comments on the arts of memory with note-taking practices. He wrote that students should rewrite what they had learned 'as if they were about to teach it'. Guarino advised students to review their day's notes each night, a practice Cicero had called Pythagorean: 'These are the exercises of the *ingenium*; these are the racetracks of the mind'.[12] Among humanists, the *exercitationes ingenii* became a kind of short hand for the bodily care and scholarly practices that underwrote the Republic of Letters, often summed up in the phrase of Sallust, 'no one exercised their *ingenium* without a body'.[13]

By the middle of the sixteenth century, these practices were absorbed into the new fashion of *method*. For the medieval schoolmen, method had been defined within the context of logic. In the most widely used logic textbook of the medieval university, Peter of Spain equivocated on the notion of *methodus*: was it simply another word for *scientia*, or was it rather the knower's stance or 'habitus' of knowledge?[14] Humanists like Jacques Lefèvre d'Étaples rehabilitated an older tradition. The one occurrence of *methodus* in early Latin was in

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11 Carrara, *De omnibus ingeniis augendae memoriae*, sig. a5r: 'Nam hunc ordinem ipsa natura porrexit, neque confundi in eis enumerandis ingenium potest.'

12 Guarino, *De ordine docendi et studendi*, in *Humanist Educational Treatises*, ed. by Craig W. Kallendorf (Cambridge, MA: Harvard University Press, 2002), p. 296, quoting Cicero, *De senectute*, 38: 'Pythagoreorumque more, extendae memoriae gratia quid quod die dixerim, audiverim, egerim, commemoro vesperi. Hae sunt exercitationes ingenii; haec curricula mentis sunt.'

13 Sallust, *The War with Catiline*, §8: 'Ingenium nemo sine corpore exercebat.'

14 Commentators on Peter of Spain or Jean Buridan normally dealt with the first line of the *Summule*, which paraphrased the first line of Aristotle's *Topica*: 'Dialectica est ars artium [et] scientia scientiarum ad omnium methodorum principia viam habens.' (Dialectic is the art of arts and science of sciences, possessing the path to the principles of all method). Compare the opening lines of introductions to logic by Pierre Tataret, Johannes de Monte, and George of Brussels.

the first line of Boethius' translation of Aristotle's *Topica*. In his commentary, Lefèvre glossed this instance of *methodus* differently than the medieval schoolmen had done:

> μέθοδος properly means 'pathway', and is applied to a compendious area of instruction. Aristotle rightly calls his disciplines [i.e. books on each field of study] by this name. For they are very brief, quickly leading us to the understanding of the matter they deal with.[15]

Here a *methodus* is an introductory textbook, an object that orders thought, rather than a conceptual structure or procedure. Over the next century, the definition of *methodus* (from the Greek 'μετ᾽ ὁδος') as *per via brevi*—quite literally, a 'short cut'—made *methodus* one of the most common titles in Renaissance textbooks.[16] *Methodus* is found 25 times in Descartes's *Regulae*, several times more than technical terms of logic such as *judicium* [10 times], *dispositio* [3], *enuntiatio*, [3], or *syllogismus* [5].[17]

This expanding genre of materially brief books shared goals with conceptual rules: both were *exercitationes ingenii*, designed to strengthen and ameliorate one's innate mental powers. Material and mental rules come together in a prosthetic genre that historians of the Renaissance have in the last two decades come to see as a fundamental piece of early modern intellectual furniture, namely the art of commonplacing.[18] Constructing lists of knowns, establishing their natural or most useful order, and disposing them for use was seen as a note-taking practice that aided the *ingenium*. The lawyer Matteo Gribaldi made this point

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15 Jacques Lefèvre d'Étaples, *Libri logicorum ad archteypos recogniti cum novis ad litteram commentariis* (Paris: Hopyl & Estienne, 1503), fol. 229r: 'μέθοδος semitam proprie significat, transsumitur ad compendiariam disciplinam, quo nomine suas jure vocat Aristoteles disciplinas. Sunt enim brevissime, et cito nos ad rei de qua sunt ducentes cognitionem.'

16 Neal W. Gilbert, *Renaissance Concepts of Method* (New York: Columbia University Press, 1960), pp. 233–35; Walter J. Ong, *Ramus, Method, and the Decay of Dialogue: From the Art of Discourse to the Art of Reason* (Cambridge, MA: Harvard University Press, 1958).

17 Bruyère, *Méthode et dialectique*, p. 387.

18 Outstanding works are Blair, "Humanist Methods in Natural Philosophy"; Ann Moss, *Printed Commonplace-Books and the Structuring of Renaissance Thought* (Oxford: Clarendon Press, 1996); Ann Blair, *Too Much to Know: Managing Scholarly Information before the Modern Age* (New Haven: Yale University Press, 2010); Yeo, *Notebooks, English Virtuosi, and Early Modern Science*.

in his treatise *De methodo ac ratione studendi libri tres* (*On the Method and Rationale for Study*):

> The *ingenium* will be greatly exercised by commonplaces, and the memory is helped a great deal by the seats of the subject matter. For indeed what art or discipline requires the sharpness of *ingenium* and the faculty for civility so much [as law]?[19]

He concluded with the thought that:

> therefore it is a great aid to the *ingenium*, for unless some kind of brief method directs it to the doorsteps of truth it easily falls victim to novelty.[20]

For Gribaldi, method kept a novice from straying into novelty. Method was a tool of discovery in the sense that it set out a discipline for use, structuring knowledge that already existed, enabling the *ingenium* to discover quickly the concepts and phrases needed to compose a text. According to the vocabulary with which Descartes would toy, Gribaldi's method was a means for disciplined *invention without novelty* within the particular domain of law.[21]

In the second half of the sixteenth century, however, 'method' was increasingly expected to perform the logical trick of ordering *all* knowledge, even making space for future, new knowledge.[22] We can trace the growing responsibilities of method for directing the *ingenium* in examples from three of the most influential intellectual movements of the century: first, the new German

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19 Matteo Gribaldi, *De methodo ac ratione studendi libri tres* (Lyon, 1556), pp. 129–30: 'Locis communibus ingenium maxime exercetur, a materiarum sedibus memoria plurimum adjuvatur. Enim vero quae ars seu disciplina ingenii acrimoniam aeque desiderat, at [c]ivilis facultas, in qua de justitiae partibus, humanam societatem conservantibus tractatur?'

20 Gribaldi, *De methodo*, p. 130: 'Tunc ingenio maxime opus est, quod nisi brevi quodam methodo ad veritatis limina derigetur, facile in tali novitate succumberet.'

21 *Inventio* was the first part of classical rhetoric manuals that the Greeks called *τέχναι*. On some sixteenth-century uses of the term, see Alexander Marr and Vera Keller, eds., *The Nature of Invention*, a special issue of *Intellectual History Review* 24:3 (2014).

22 On the growing need for knowledge schemes to find places for future discoveries, see Vera Keller, *Knowledge and the Public Interest, 1575–1725* (New York, NY: Cambridge University Press, 2015).

universities which built on the teaching of Philipp Melanchthon; second, Peter Ramus, who found devoted followers in England and Germany; and finally the Jesuits, who offered a Catholic response to these movements.

First, the Melanchthonians. The great pedagogue himself wrote several handbooks on rhetoric and dialectic.[23] Although he never called these 'methods', over time he placed an increasing weight on dialectic as the site of invention, the finding and ordering of commonplaces (*loci communes*). This process of invention was relevant for training the *ingenium*. His mature version, the *Erotemata dialectices*, 'written so it can usefully be set for pupils', was first published in 1547 and widely republished with an opening letter that discussed how crucial the *ars dialecticae* was for training the *lumen naturale* (natural light) and the *vis naturae* (power of nature) of youthful *ingenia*, lest they become *ingeniosi* (subtle, sophistical minds) tangled in spurious arguments.[24]

Melanchthon's legacy was made explicitly methodical by one of the most productive of his students, the Danish theologian Niels Hemmingsen,[25] whose earliest publication *De methodis libri duo* (1578) likely captures his experience at Wittenberg between 1537 and 1542, around the same time. The book offers a compendium of approaches to method—it will serve us as a snapshot of options available by the mid- sixteenth century and therefore is worth a few paragraphs here. The preface situates Hemmingsen's method among the handbooks for students, and without naming the *ingenium* alludes to the divine spark that draws studious youths (*studiosae juventutes*) to study, 'for how does the man who does not seek, follow, and love quickness in learning and the path of teaching, differ from a beast?'[26] Then immediately the definition:

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23 An overview of this development is given by Peter Mack, *A History of Renaissance Rhetoric 1380–1620* (Oxford: Oxford University Press, 2011), pp. 106–22.

24 Philipp Melanchthon, *Erotemata dialectices, continentia fere integram artem, ita scripta, ut juventuti utiliter proponi possint* ([1547] Frankfurt, 1550), sig. α2r–6r.

25 A basic outline of Hemmingsen's life is found in D. Albert Hauck, ed., *Realencyklopädie für protestantische Theologie und Kirche*, 3rd ed. (Leipzig, 1899), VII, pp. 659–62.

26 Niels Hemmingsen, *De methodis libri duo, quorum prior quidem omnium methodorum universalium et particularium, quarum usus est in Philosophia, brevem ac dilucidam declarationem: posterior vero Ecclesiasten sive methodum theologicam interpretandi concionandique continet* (Leipzig,

> What is method? A way of teaching by certain reasoning. That is, method is the mode of teaching by which prompting and leading each single thing is located, as it is explained, in the appropriate and fitting place.[27]

Methods, he goes on, come in two kinds: particular method, which deals with a specific discipline; and universal method, which is appropriate to any art. Of these, his universal method is the most interesting for us, as it suggests the ambitions for universal knowledge that would characterize Descartes's own reflections on method.

Hemmingsen's universal method involves two modes increasingly discussed at the time: synthesis and analysis. He observes that the word 'synthesis' comes from the mathematical mode of demonstration, leading from simpler statements to more complex conclusions.

> As a result, this method of synthesis proceeds from principles and the elements of things, which are easier and better known to the intellect, until it concludes at the end.[28]

Yet the breadth of this approach extends far beyond mathematics; Hemmingsen claims that this definition applies to grammar, Aristotle's *Categories* and *Politics*, Euclid's *Geometry*, as well as Lombard's *Sentences* in theology. The second mode of analysis, Hemmingsen explains, similarly denotes a mathematical mode of demonstration, but proceeds in the opposite direction:

1578), p. 1: 'Quid enim quaeso homo iste a bruto differt, qui discendi promptitudinem ac docendi viam non studiose quaerit, sectatur, amat?' On the following page (p. 2), he notes that the light of methodically observing the order of things removes their difficulty: 'et quemadmodum lumen in obscurum locum illatum tenebras pellit, ita ordinis recta observatio, difficultatem, quae alioqui in rebus existeret, tollit.' (and just as a light brought into a dark place drives away the shadows, so correct, orderly observation removes the difficulty which otherwise would exist in things.)

27 Hemmingsen, *De methodis*, p. 3: 'Quid est methodus? Methodus est via docendi certa cum ratione, hoc est, methodus est ratio docendi, cuius admonitu, et ductu, singula in rerum explicatione aptis et accommodatis locis collocantur.'

28 Hemmingsen, *De methodis*, pp. 5–6: 'Ita haec universalis Synthesis a principiis et elementis rerum progreditur, quae sunt intellectu faciliora et notiora, donec ad finem pervenerit.'

> Analysis is the return from posterior statements to the principles and causes out of which they were constructed. That is, analysis is the ascent from the end [of the argument] back to the principle, and *its* principle is the conclusion that had been the end of synthesis.[29]

He draws on examples of analysis increasingly important to debates about method, including mathematics, Galen's writings on method, and the syllogistic reasoning of Aristotle's *Prior* and *Posterior Analytics*.[30]

The bulk of Hemmingsen's book applies these universal methods to particular cases. One case especially is worth taking up here, because it connects analysis to *enumeratio*, a key operation for Descartes. The first rule of Hemmingsen's *enumeratio* is to break the object of study down to its minimal parts, for example dividing 'man' first into body and soul, then into the various parts of the soul and members of the body, and finally into the various kinds of matter that make up a human body. Then one can apply the rules of *enumeratio*, which Hemmingsen envisions as a verbal process that begins with matching things (minimal parts) to words through their 'natural signification.'[31] By enumerating or picking up those words in proper sequence, one can construct 'stronger arguments' that demonstrate the matter at hand.

Analysis, picking words apart from things and other words, takes a certain intuition—immediacy mattered to Hemmingsen too. Alongside synthesis and analysis, he identified a third form of method, *diaeresis*, the dichotomous division of a domain into two. Although Hemmingsen defines *diaeresis* as a third universal method, he also identifies it with a particular version of analysis. Yet he also sees *diaeresis* as a distinct method because certain people especially promoted it as such, with distinct goals. Different scholars prefer different methods, he notes, and

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29 Hemmingsen, *De methodis*, p. 10: 'Analysis est ex posterioribus recursus ad principia et causas, ex quibus quae effecta sunt constitutionem habent. Hoc est, Analysis est ascensus a fine ad principium, cuius principium conclusio illa est, quae fuerat finis in Synthesi.'

30 For an overview of these sources, see Gilbert, *Renaissance Concepts of Method*, chapters 1 and 2.

31 Hemmingsen assumes that words, when invented, originally displayed a natural link between *res* and *vox*: 'Est enim naturalis significatio, quam primum habuit vox cum inventa est. Naturalia enim dicuntur, quae cum unoquoque nata sunt' (*De methodis*, p. 37).

> some prefer analysis and diaeresis to synthesis for the reason that they think it more apt to the *ingenia* of men … since they lead the students back to the principles and sources. I cannot disapprove.[32]

Hemmingsen here was thinking about Peter Ramus, with whom dichotomous method is most often associated, identifying the promise that earned Ramus droves of avid followers: the promise of a method that would take them right to the principles of nature. Hemmingsen clearly approves of this goal, but also seems uncertain how to teach a method so dependent on immediate, intuitive procedures.

In fact, Ramus founded his whole project on the pedagogical view of the *ingenium*. This is the starting point in his first, inflammatory account of a new method in the *Dialecticae institutiones* (1543). The book opens with the claim that dialectic is a 'power' (*vis*) of the *ingenium*. His is a 'natural dialectic', in which the inborn nature of the human mind warrants the reliability of its notions:

> Belonging to man, and born with him, is a natural dialectic, that is *ingenium*, reason, mind, image of God the parent of all things, and finally the light emulating that happy and eternal light.[33]

The details of this natural dialectic are admittedly tricky to pin down, all the more because Ramus reworked his method repeatedly. The overarching role of dialectic was rooted in nature, he said, but refined in teaching (*doctrina*) and worked

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32 Hemmingsen, *De methodis*, p. 20: 'Alii Analysin et Diaeresin praeferunt Synthesi, eo quod ingeniis hominum aptius esse judicant … donec ad principia et fontes ipsos discentes deduxerint. Tametsi autem haec improbare non possum.' If Hemmingsen could not disapprove Ramus, neither did he approve; see pp. 20–1: 'Nec audiendum esse judico Ramum, virum alioqui doctum et bonum, qui unam tantum universalem Methodum agnoscit, nimirum platonicam: pugnat enim non solum cum Aristotele quem ipse contemnit, verumetiam cum natura et experientia.' (Nor do I think we should listen to Ramus, a man otherwise learned and good, who only knows one universal method, no doubt the Platonic one; for not only does he fight with Aristotle, whom he condemns himself, but also with nature and experience.).

33 Peter Ramus, *Dialecticae institutiones* (Paris, 1543), fol. 6r: 'naturalis autem dialectica, id est, ingenium, ratio, mens, imago parentis omnium rerum Dei, lux denique beatae illius et aeternae lucis aemula, hominis propria est, cum eoque nascitur.'

out in practice (*exercitatio*).[34] Ramus here assembles a method out of the Ciceronian *exercitationes ingenii* common to the educational tradition. But Ramus added the sense of utility: *exercitatio* produced useful works (*opera*), applying knowledge to work in the world.

While nature provided the basic principles, method was responsible for ordering the matter into knowledge. The first part of Ramus' own method lies close to what Hemmingsen called analysis. As we might expect from Melanchthon and Hemmingsen, the *ingenium* played a role in the immediate intuition of the order of things. In this first procedure—traditionally called invention—one analysed complex wholes into simple constituent principles.

But Ramus added a second key procedure, what he called 'second judgment' or disposition. After invention has summed up the collection of minimal parts (i.e. the elements of syllogisms), second judgment 'provides the collocation and ordering of many and various arguments cohering to one another and linked as by an unbroken chain so as to lead to one certain end'.[35] It is this procedure, recollecting the simple principles through enumeration, that Ramus would develop as the most distinctive feature of his method. And Ramus framed this procedure of second judgment within topoi of ingenuity, notably finding its origins in the inventive Prometheus and thereby suggesting that the very capacity to order mentally is a divine gift.[36]

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34 Ramus, *Dialecticae*, fol. 5v: 'Comparatur igitur dialectica, sicuti vis artium reliquarum, natura, doctrina, exercitatione'. Here Ramus drew on the standard triad of *natura-doctrina-exercitatio*, inherited from Cicero, Quintilian and presumably the Greek rhetorical tradition they transmitted. See Kambouchner in this volume.

35 Ramus, *Dialecticae*, fol. 27r: 'Secundus [judicii gradus] collocationem tradit, et ordinem multorum, et variorum argumentorum cohaerentium inter se, et perpetua velut catena vinctorum, ad unumque certum finem relatorum: cuius dispositionis partes duae principes sunt, definitio, distributioque. Res enim primum universa definienda et explananda, deinde in partes diducenda est.' Cf. Ong, *Ramus, Method*, p. 187, who translates *certus finis* as 'determined', inferring that this means 'predetermined'. But the inference may be coloured by Ong's polemic against Ramus. The word 'certain' could just mean that the end is arrived at by a reliable chain of inferences.

36 The Promethean origins of second judgment are mentioned at Ramus, *Dialecticae*, fol. 27v; see also Ramus, *Animadversiones Aristotelicae* (Paris, 1543), fol. 73v.

Ramus' method remained vague in specifics. Yet it boasted tremendous ambitions: on the one hand, a universal system of knowledge; on the other hand, a radically simplified procedure for obtaining that knowledge, rendering it clearer and more immediate to knowers. The attractiveness of these promises can be measured from the growing number of books—whether or not directly responding to Ramus—which offered schematic or tabular approaches to all knowledge. The massive number of such 'methods' has been widely documented.[37]

The Society of Jesus offered a third, different approach that gave institutional weight to a culture of ingenuity. Concern about both method and the *ingenium* permeate the whole Jesuit programme of education.[38] The final version of the *Ratio studiorum* of 1599 already bears the imprint of this language, not only in its title and lists of *regulae*, but also in its specifics. Indeed, the first rule for a professor of philosophy is that his *ingenium* should be well ordered.[39] Teachers of the elementary classes were encouraged to hold 'special exercises' (*exercitationes extraordinariae*), 'in order to cultivate *ingenia* and not merely to exercise the memory'.[40]

For a teaching society like the Jesuits, the care of souls was also a *cultura ingeniorum*, in the phrase of the influential Antonio Possevino. He was well aware of the lengthy gestation of the *Ratio studiorum*, acting as its first historian in the preface to the three large folio volumes of his *Bibliotheca selecta* (1593). Possevino's work reflects on the structure of the Jesuit cycle of

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37 The massive bibliography of editions directly linked to Ramus was largely collected by Walter J. Ong, *Ramus and Talon Inventory* (Cambridge, MA: Harvard University Press, 1958). On the wider phenomenon of books composed as branching tables relating to Ramus, see Steffen Siegel, *Tabula: Figuren der Ordnung um 1600* (Berlin: Akademie Verlag, 2009).

38 See Garrod in this volume. More generally on Jesuit education, see Gabriel Codina Mir, *Aux sources de la pédagogie des jésuites. Le "Modus parisiensis"* (Institutum Historicum S. I., 1968); Aldo D. Scaglione, *The Liberal Arts and the Jesuit College System* (Amsterdam ; Philadelphia: J. Benjamin, 1986); Antonella Romano, *La Contre-Réforme mathématique: constitution et diffusion d'une culture mathématique jésuite a la Renaissance (1540–1640)* (Rome: École française de Rome, 1999).

39 Georg Michael Pachtler, ed., *Ratio studiorum et institutiones scholasticae Societatis Jesu per Germaniam olim vigentes collectae concinnatae*, Monumenta Germaniae Paedagogica (Berlin: A. Hofmann & Co., 1887), p. 328.

40 Pachtler, ed., *Ratio studiorum*, p. 378ff. Rule 32: 'Extraordinariae exercitationes (et publica specimina) utilitatem magnam habent … ut non memoria solum discipulorum, sed ingenium etiam excolatur.'

studies. It presents itself as a *methodus*, though not in the analytical fashion of Hemmingsen or Ramus. Instead, Possevino cited Jean Bodin's *Methodus ad faciliorem cognitionem historiae* (1566) as a rival.[41] Possevino presented the whole of knowledge as a history: he began with divine history, moving through Creation and the history of God's people Israel in deep antiquity, to the philosophies of the Greeks, finally to the medicine and law of the Romans, which brought him, in stepwise fashion, to the modern day. The 'method' of all this knowledge consisted partly in its chronological ordering, but also in a description of the basic parts of knowledge in each discipline. Most importantly, then, Possevino's method consisted in a massive, critical, and systematically arranged bibliography.[42]

Though very different from Ramist analysis, Possevino's vast method nevertheless began with care of the *ingenium*.[43] The book's first page promises a 'certain rationale', or 'brief' and 'easy' exercises for directing 'better wits' (*ingenia meliora*).[44] In fact, the first part of the *Bibliotheca* is the lengthy *Cultura ingeniorum*, a treatise that was reprinted and translated on its own several times. In the first chapters, Possevino addresses the diversity of intellectual powers and their existence as a gift, as a *lumen* given by God at birth. One of his chief sources is Juan Huarte de San Juan's *Examen de los ingenios* (1575, second revised edition in 1594), and like his source, Possevino addresses the noetic effects of the Edenic Fall into sin.[45] But where Huarte

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41 Antonio Possevino, *Bibliotheca selecta: qua agitur de ratione studiorum*, 3 vols (Rome: Typographia Apostolica Vaticana, 1593), I, pp. 129–42, for a lengthy critique of Bodin's work. For more, see Michaela Valente, "The Works of Bodin under the Lens of Roman Theologians and Inquisitors," in *The Reception of Bodin*, ed. Howell A. Lloyd (Leiden: Brill, 2013), pp. 219–35, (p. 226). On Possevino's frequent use of *methodus* see Helmut Zedelmaier, *Bibliotheca Universalis und Bibliotheca Selecta*. *Das Problem der Ordnung des gelehrten Wissens in der frühen Neuzeit* (Cologne: Bölhau Verlag, 1992), p. 216 n. 630.

42 Possevino explains this order at *Bibliotheca selecta*, I, pp. 8–11. See also Antonio Possevino, *Cultura ingeniorum* (Treviso, 1606), p. 123ff, which addresses bibliographical practices as tools for the recovery and betterment of knowledge.

43 For another reading along the same lines, see Zedelmaier, *Bibliotheca*, pp. 191–213, which is a section on "spiritual health through method: towards a theory of *ingenium*".

44 Possevino, *Bibliotheca*, p. 1.

45 Peter Harrison has explored the significance of this theme (though not with respect to Huarte) in *The Fall of Man and the Foundations of Science* (Cambridge: Cambridge University Press, 2007).

veers toward determinism, Possevino is more optimistic about the malleability of the *ingenium*. Huarte suggests that each person is only really suited for one particular field of activity. As Possevino puts it, Huarte admits that those who know how to paint or draw have some faculty of thought within them, but he denies they have enough of that power for the deep perception that characterizes highly abstract disciplines. 'For this reason [Huarte] has no hope that they will ever be philosophers or theologians'.[46] But Possevino thinks differently: 'I would say that if the concepts [*species*] that come into thought while writing or painting, were not to remain stuck in that path, and the intellect was to pour itself into them, there is no reason anyone cannot take either [philosophy or theology].[47] The Jesuit thus displays much more confidence than Huarte in the power of teaching—method, practices—to shape one's *ingenium* as the collection of natural inclinations.

Possevino and Huarte turn to the *ingenium* for very different reasons, which helps us to locate Descartes's place in the culture of ingenuity. Huarte's goals are broadly civic. Sorting *ingenia* into their best-suited occupations helps society achieve fruitful works. Possevino likewise is convinced that there will be 'fruits' and social benefits to moulding minds according to their strengths. But his aims are theological, closely linked to the care of souls and their shared responsibilities toward God. The Jesuit's methodical sequence of studies, therefore, is more egalitarian and inward, evincing qualities at the heart of the Cartesian programme.[48]

2 The *Ingenium* and the Promises of Mathematics

46 Antonio Possevino, *Cultura ingeniorum* (Treviso, 1606), pp. 43–44: 'Nec vero admittit Huartes, qui pingere aut scribere scire, operam dant, quibus cum facultas cogitandi insit, negat intelligendi esse vim illam autque percipiendo vero sit satis. Quamobrem desperat istos fore umquam Philosophos sive Theologos.'

47 Possevino, *Cultura ingeniorum*, p. 44: 'Dixerim ego, si quemadmodum scribendo et pingendos [sic], species, quae in cogitationem cadunt, haud in ea sisterent gressum, sed intellectus in eas sese effunderet, nil obesse cur utrumque aliquis capere possit.'

48 Cf. Descartes, *Discours de la méthode*, AT IV, p. 1: 'Common sense is the most widely shared thing in the world' (Le bon sens est la chose du monde la mieux partagée). On the relationship of *bon sens* to *esprit* and *ingenium*, see Ariew and Garrod in this volume.

The aspiration of universal method, rules for sorting simple notions and assembling them into a chain, leading from intuitions to composite wholes, all rooted in a vision of training the human *ingenium*—these elements define the Cartesian method as we find it in the *Regulae*. So far, I have suggested that 'methods' like those of Descartes should be read in a tradition that had privileged these aspects of method. Yet in these manuals for training the *ingenium*, mathematics did not hold a prominent role, whereas mathematics is central for Descartes. After all, most modern observers have found Descartes's daring innovation in his drastic narrowing of a rich substance metaphysics into a spare physics of extension, in which mathematics offers the paradigm of methodical clarity.[49] But in the *Regulae* the role of mathematics is tantalizingly unclear. As David Rabouin has shown, there is a disconnect between Descartes's claim of mathematical ease and the difficulty with which he performs his own early mathematics, which suggests that his choice of mathematics is highly contrived.[50] Furthermore, the *mathesis universalis* in rule 4 is notoriously difficult to strip of its veil: is the method only modelled on mathematics by analogy, or does the method comprise the deep structure of mathematical reasoning itself?[51] I shall suggest that Descartes reflects a historically rooted ambivalence about mathematics and its role in methods for sharpening *ingenia*.

In the genre of rules for study I sketched in the previous section, mathematics played a propaedeutic role. Thus mathematics supplied *exercitationes* to strengthen critical faculties and help students form judgments. This was a faithful version of Plato's position in the *Republic*, where he raised the possibility that arithmetic and geometry have a certain

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49 An art of simple natures (*res simplicissimae*), as Descartes calls it in rule 6 (AT X, pp. 381–3). Cf. Rule 12, AT X, p. 427: 'all human *scientia* consists in this one thing, so that we should see distinctly in what way those simple natures come together all at once in the composition of other things'. See also pp. 418–19.

50 David Rabouin, "What Descartes Knew of Mathematics in 1628," *Historia Mathematica*, 37.3 (2010), pp. 428–59.

51 See first the classic accounts of Jean-Paul Weber, *Constitution du texte des "Regulae"* (Paris: Société d'Édition d'Enseignement Supérieur, 1964), especially pp. 3–17, Jean-Luc Marion, *Sur l'ontologie grise de Descartes: science cartesienne et savoir aristotélicien dans les "Regulae"* (Paris: Vrin, 1975), Robinet, *Aux sources de l'esprit cartésien*, pp. 249–52; Philippe Desan, *Naissance de la méthode: Machiavel, La Ramée, Bodin, Montaigne, Descartes* (Paris: A.-G. Nizet, 1987).

'commonality' which makes them suitable for training the mind.[52] Ultimately, however, Plato found that mathematics only enables one to think dialectically; it is not itself the dialectic that directly intuits the good. Students met endless retellings of the story that Plato had forbidden any without geometry to enter his academy, reinforced by references to Book 7 of *The Republic*. The topos seems rather tame from our perspective, but it could motivate powerfully. In a few cases, the point was worked up into a full-length defence of studies organized on the foundation of mathematics, as in the circle of Lefèvre d'Étaples (c. 1455–1536), who reordered the university curriculum to begin with mathematics.[53] Giorgio Valla similarly reorganised the entire cycle of studies around mathematics in his massive encyclopedia *De expetendis et fugiendis rebus* (1501) (*On What to Seek and Flee*). He justified this arrangement with an account of the soul and its powers—in his taxonomy, '*ingenium* is the power of the soul which extends and acts toward the understanding of unknowns'.[54] Drawing on Boethius and the medieval Pythagorean tradition, Lefèvre and Valla occasionally seemed to award mathematics an ontologically prior position that justified mathematics as a kind of universal science.[55] Nevertheless, the actual effect of their developed statements on pedagogy fit within traditional lineaments: mathematics was thought to 'sharpen wits', simply as a propaedeutic to further studies.

This propaedeutic value became a commonplace. It was a central theme in the various apologies for mathematics by perhaps the most visible mathematical practitioner of the sixteenth century, Oronce Fine.[56] The popularizing printer-

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52 On this 'commonality' (κοινωνία) see Plato, *Republic*, 531d.

53 Preface to Jacques Lefèvre d'Étaples, *Textus de Sphaera* (Paris, 1495). On this reordering of university studies, see Richard Oosterhoff, *Making Mathematical Culture: University and Print in the Circle of Lefèvre d'Étaples* (Oxford: Oxford University Press, 2018).

54 Giorgio Valla, *De expetendis et fugiendis rebus* (Venice, 1501), a2v: 'Ingenium est animi vis qua extendit et exercet ad incognitorum cognitionem.' The source is Augustine; see Agostini in this volume.

55 For medieval hints at a mathematical universal science based on Boethius, see David Albertson, *Mathematical Theologies: Nicholas of Cusa and the Legacy of Thierry of Chartres* (Oxford: Oxford University Press, 2014).

56 Angela Axworthy, *Le Mathématicien renaissant et son savoir. Le Statut des mathématiques selon Oronce Fine* (Paris: Classiques Garnier, 2016); Alexander Marr, ed., *The Worlds of Oronce Fine: Mathematics, Instruments and Print in Renaissance France* (Dodington: Shaun Tyas, 2009).

apothecary of Strasbourg, Hermann Walther Ryff, repeated the notion in his collections on mathematical arts.[57] The abacus master Niccolò Tartaglia reinforced the point by assuring that 'gold is tested by fire, and wit by mathematics' (*aurum probatur igni, et ingenium mathematicis*) on the frontispiece of his *Nova scientia* (1537). In England, Robert Recorde titled his handbook to arithmetic *The Whetstone of Witte* (1557), and the poem prefacing his geography manual, *The Pathewaie to Knowledge* (1551), made the propaedeutic promise explicit:

> All freshe fine wittes by me [i.e. geometry] are filed,
> All grosse dull wittes wishe me exiled:
> Though no mannes witte reiect wil I,
> Yet as thei bee, I will them trie.

The capacity of mathematics to sharpen the *ingenium* was a particular theme among the German professors who made up Philipp Melanchthon's wider network. The Strasbourg professor of Greek, Simon Grynaeus had studied mathematics together with Melanchthon. In his *editio princeps* of the Greek Euclid, together with Proclus' commentary, Grynaeus argued that geometry in fact is the one means of fixing all the disciplines, precisely because it can restore the powers of the mind.[58] He drew on the *ingenium* as the source of novelty by presenting the New World as a discovery of ingenious cosmographers.[59] But the most widely read account of mathematics' propaedeutic power was Melanchthon's own orations on the disciplines, the most famous portions of which were dedicated to his old school friend Grynaeus. Melanchthon wove together commonplaces on how astronomy revealed the powers of the mind, on the simplicity and ease of arithmetic, and on how arithmetic prepared the

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57 Alexander Marr, "Walther Ryff, Plagiarism and Imitation in Sixteenth-Century Germany," *Print Quarterly*, 31 (2014), pp. 131–43.

58 Euclid, *Στοικειον βιβλιον … in Euclidis Geometriae elementa Græca. Adiecta præfatiuncula in qua de disciplinis mathematicis nonnihil*, ed. Simon Grynaeus (Basel, 1533), sig. a4r. Grynaeus discusses the worth of such knowledge in practical applications, such as the travel to the New World, and cannons—and then shifts from wonder at these *machinae* to God's even greater marvels in the created world.

59 Preface to Simon Grynaeus, *Novus orbis regionum et insularum* (Basel, 1532).

mind best for dialectic.[60] In particular, he stressed over and over again how God provoked and excited human understanding to understand the wondrous natural order; his account of the intellectual task depended on a survey of inborn gifts.[61]

What is at stake here is precisely the issue that Descartes leaves ambiguous: is mathematics a convenient *analogy* for a universal mode of thought? Or—and this is the key alternative—is mathematics itself the simplest formulation of that mode? Is mathematics but one expression of logic, what Plato called dialectic, or does logic collapse into mathematics? As we saw in the last section, Melanchthon's student Hemmingsen carefully documented how mathematics offered useful models of analysis and synthesis for a universal method, but he never reduced method to these operations. Descartes's mention of a *mathesis universalis* is fascinating precisely because it raises the possibility of such a unity of method in mathematics. Scholarship on Descartes's sources has unearthed a clutch of late sixteenth-century authors who reflected on mathematics as such a candidate universal science: notably Benito Pereira, Pietro Catena, Peter Ramus, Conrad Dasypodius, Adriaan van Roomen, and Johann Heinrich Alsted.[62] Through these figures, a key source for the name as well as the notion of a *mathesis universalis* is the ancient commentary on the first book of Euclid by Proclus, who provided a *locus classicus* for the idea that a certain unity or 'commonality' underlay both arithmetic and geometry—and indeed, 'all the disciplines'.[63]

The reception of Proclus is tangled, and I could not do it or its historians justice in rehearsing it here. But a perusal of the various sources is already revealing, because of how distant it is from the established literature of methods for direction of the

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60 Sachiko Kusukawa, ed., *Philip Melanchthon: Orations on Philosophy and Education*, trans. Christine F. Salazar (Cambridge: Cambridge University Press, 1999), pp. 105–25.

61 Philipp Melanchthon, *Mathematicarum disciplinarum encomia* (Strasburg, 1537), A3r.

62 The first point of call is Giovanni Crapulli, *Mathesis universalis: Genesi di un'idea nel XVI secolo* (Rome: Ataneo, 1969). A useful overview of older historiography is found in Chikara Sasaki, *Descartes's Mathematical Thought* (Dordrecht: Kluwer Academic Publishers, 2003), pp. 189–203, but see now David Rabouin, *Mathesis universalis: l'idée de 'mathématique universelle' d'Aristote à Descartes* (Paris: Épiméthée, 2009).

63 Glenn R Morrow, *Proclus: A Commentary on the First Book of Euclid's Elements* (New Jersey: Princeton University Press, 1970), prol. 19–20; def. 93.

ingenium. Only very occasionally, and incidentally, do these overlap. Perhaps the most obvious but perplexing is Ramus' view that the simplest principles are ultimately mathematical and innate to human nature. Ramus used the *ingenium* in many of the same ways that Descartes would do: a certain 'natural light' capable of intuiting analytical truths. In the first manuscript edition of the *Dialecticae institutiones* (1543), Peter Ramus included a section on a 'mathesis' as another name for his 'natural dialectic', the gift belonging to the *ingenium*.[64] Ramus expanded on this idea after turning his attention to the mathematical arts in 1544. In fact, he argued, the innate *mathesis* of the human mind was borne out in the history of learning. He obligingly endeavoured to supply the true history, surmising a genealogy of mathematics as the oldest of intellectual disciplines—and therefore the most fundamental form of reasoning.[65] In this history, Euclid (and then Proclus after him) had obscured this commonsense mathematics with layers of commentary.

Another place where the *ingenium* and universal mathematics meet is in the Italian *quaestio de certitudine mathematicarum*, as historians have dubbed the sixteenth-century debate over the logical status of mathematics.[66] The idea that mathematics is the basis for logic is central to one of its protagonists, Pietro Catena (1501–1577). In his short *Oratio pro idea methodi* (1563), Catena argues that method is powerful because of its interlinking chain of demonstrations, which can be easily enumerated.[67]

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64 This section of MS is edited in Nelly Bruyère, *Méthode et dialectique*, pp. 52–54.

65 See Robert Goulding, *Defending Hypatia: Ramus, Savile, and the Renaissance Rediscovery of Mathematical History* (New York: Springer, 2010), pp. 52ff. Euclid (and then Proclus after him) had obscured this natural method, Ramus claimed: Peter Ramus, *Scholarum mathematicarum, libri unus et triginta* (Basel, 1569), pp. 76ff.

66 Besides the useful overview of Antonella Romano in *La Contre-Réforme mathématique*, pp. 153–161, see especially Paolo Mancosu, "Aristotelian Logic and Euclidean Mathematics: Seventeenth-Century Developments of the *Quaestio de certitudine mathematicarum*," *Studies in History and Philosophy of Science*, 23.2 (1992), pp. 241–65. Key sources are outlined in Giulio Cesare Giacobbe, "Epigono nel seicento della *Quaestio de certitudine mathematicarum*: Giuseppe Biancani," *Physis*, 18.2 (1976), pp. 5–40; idem, "Un gesuita progressista nella *Quaestio de certitudine mathematicarum* rinascimentale: Benito Pereyra," *Physis*, 19, 1–4 (1977), pp. 51–86.

67 Petrus Catena, *Oratio pro idea methodi* (Padua, 1563), fol. 5v.

Mathematics, of course, perfectly suits this criterion. Moreover, he argues that other methods have failed because they were too varied, too obscure and confused:

> It would require a divine rather than human *ingenium*, whether in natural or moral philosophy, to encompass with the mind such a great multitude of things, to gather such variety into a few kinds, to display such obscure things before one's eyes, and finally to unravel and unfold that indiscriminate mass of parts so that the skill of nature is shown exactly by unchanged doctrine.[68]

The mathematical disciplines supply such a marvellous method, he says, because they consider the incorruptible forms of things, simply and separately.[69]

Both Ramus and Catena supply a revealing set of priorities, when they link the *ingenium* and mathematical method: both rely on mathematical objects as incorruptible, innate elements of human rationality. But it must be said that Ramus is unusual in making the *ingenium* a central pillar of his account of mathematical method; the word emerges somewhat incidentally in Catena. Taken as a whole, the debate over *mathesis universalis* was separate from the methodical handbooks directing *ingenia*. One might, for example, expect that the Jesuits would explore the possible connection between mathematics and method in these terms.[70] But (so far as I can tell) this is decidedly not the case. Clavius makes strong statements about the propaedeutic role of mathematics, but he defends the difficulty of his subject instead of passing it off as easy or natural,

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68 Here I paraphrase Catena, *Oratio*, 6v: 'Divino enim ingenio, non humano, esset opus, vel in disciplina naturae, vel in philosophia morum, tantam rerum multitudinem animo comprehensam habere, tantam varietatem in pauca genera collegere, res tam obscuras ante oculos proponere, postremo caecam illam partium con[g]eriem ita evoluere, atque explicare, ut naturae artificium imutata doctrina adamussim ostendatur.'

69 Catena, *Oratio*, fol. 6v–7r: 'quia non considerantur res ex corruptibili materia et forma conflatae, sed simplices, ac separatae formae'.

70 In contrast, those associated with the *Quaestio de certitudine mathematicarum* tend not to use the word *ingenium* regularly for mental faculties, preferring other terms from Aristotelian faculty psychology (perhaps because they tend to be more precise). In his translation of Proclus, for example, which is full of reflection on the inborn mathematical powers of the soul, Barozzi constantly describes instead the *vis cogitandi*, or the *vis intelligendi*.

nevermind innate.[71] In his *Cultura ingeniorum*, Possevino gives Pythagoras and Plato as his first examples of how one might have talent for particular studies.[72] Yet when he actually provides an introduction to these topics in his grand *Bibliotheca*, Possevino is very clear that mathematics gets its demonstrative power from logic, not the other way around.[73]

The point is simple. Descartes no doubt was inspired by a late sixteenth-
century debate over a *mathesis universalis*. But his over 60 uses of the word *ingenium* in the *Regulae* are hard to explain on that basis alone. His powerful innovation lies in grafting approaches from this mathematical method onto the broader project of directing the *ingenium*. The uneven fit of these two components perhaps goes some way to explaining the ambivalent nature of the *mathesis universalis* that have plagued interpreters of Rule IV.

3 Conclusion

The ambition to master all knowledge, the limits of one's *ingenium*, and the challenge of augmenting it—these problems set the tenor of intellectual life from fifteenth-century pedagogues up to the polyhistors of Enlightenment Germany. They fostered a tremendous growth industry of pedagogical manuals, diverse in form but united in purpose: handbooks, arts of memory, panoptic tables, and above all *methods*.

The notion that mathematics was particularly effective at shaping wits, that it offered a model for method, and that it was simple, brief, and allowed one to order and enumerate mentally the simplest components of a domain—these were all *topoi* within the methods handbooks. As I have suggested, the connection between *ingenium* and mathematics is somewhat incidental to those authors such as van Roomen and Alsted who were preoccupied with a *mathesis universalis*. I suggest we consider how Descartes operated in both traditions: the *Regulae* was not simply a treatise on *mathesis universalis*, as it is

71 Christopher Clavius, *Euclidis Elementorum libri XV* (Rome, 1574), letter to reader.

72 Possevino, *Cultura ingeniorum*, pp. 44ff.

73 Possevino, *Bibliotheca selecta*, II, pp. 176–77.

sometimes tempting to read it, but reimagines a broader pedagogical discourse around this distinctive topos.

This was the way at least some seventeenth-century readers saw him. Meric Casaubon suspected that Descartes was a methodizer, one of the reformers of learning who sought a shortcut to all knowledge. Casaubon compared him to Peter Ramus, Ramon Lull, and Trithemius, the sort who offered a 'new project, promising new discoveries of a shorter way'.[74] Casaubon introduces the need, on the one hand, for anyone seeking to reform knowledge to have a 'competent wytt and judgment', while Descartes's *Discours de la méthod*e revealed him as 'one, whom excessive pride & self conceit … hath absolutely bereaved of his witts'.[76] He blamed it on Descartes's social circles, which put him up to such a project 'against his own judgment, at first, & undertaken by him rather by way of exercise (to shew his witt, or to please some) than [as] a serious taske'.[77] Casaubon's sharp reading locates Descartes' methodical project within a culture of ingenuity, both in the older sense of arts or methods to train the *ingenium*, and in the newer sense of salon *esprit*.

74 Richard Serjeantson, *Generall Learning: A Seventeenth-Century Treatise on the Formation of the General Scholar by Meric Casaubon*, Renaissance Texts from Manuscript, no. 2 (Cambridge: RTM Publications, 1999), p. 146 (MS p. 21).

76 *Generall Learning … by Casaubon*, p. 146 and 148.

77 *Generall Learning … by Casaubon*, p. 150.